REMARKS/ARGUMENTS

Claims 1-32 are pending.

As currently presented, all the pending claims of the subject application comply with all requirements of 35 U.S.C. Accordingly, Applicant requests examination and allowance of all pending claims.

Election/Restrictions

The Office Action mailed 5/20/2004 ("Office Action") includes a statement, relating to election/restrictions, that appears to erroneously indicate final rejection status for the present application. The Office Action at p. 2 states: "A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.02." However, no final rejection has been issued in the present application. Thus, it appears that the above-quoted statement may have been inadvertently inserted in the Office Action, and clarification is respectfully requested.

Drawings

The Office Action objects to the drawings under 37 CFR 1.84(p)(5) and points out that the text of the specification does not refer to block "20" in Fig. 1. Per the Examiner's suggestion, the text of the specification is hereby amended to include an explicit reference to block "20." This amendment to the specification adds no new matter. As amended, the specification overcomes the objection under 37 CFR 1.84(p)(5), and withdrawal of the objection is requested.

Rejection under 35 USC § 112

Applicants respectfully traverse the rejection of claims 2-32 under § 112. The specification provides a clear and mathematically concise description of the term "closed set of symbols." The specification at p. 4, line 33 to p. 5, line 1 states: "... with symbol a_k drawn from the M-ary <u>closed set of symbols</u> $A = \{A_0, A_1, \ldots, A_{M-1}\}$" (*emphasis added*). It is believed that one of ordinary skill in the art, upon reading this description, would easily recognize that the mathematical expression $A = \{A_0, A_1, \ldots, A_{M-1}\}$ refers to a set of symbols having M members (thus "closed"), denoted as $A_0, A_1, \ldots, A_{M-1}$. This is a basic mathematical expression listing the possible member of a closed set. Because the expression does not limit itself to a particular

value of M, not all of the members are explicitly listed. Instead, the list begins with "$A_0, A_1, \ldots$" and ends with "A_{M-1}." As one of ordinary skill in the art would understand, this indicates that the closed set of symbols has M members, but the value of M is not necessarily specified.

The specification also provides clear examples of a closed set of symbols where the value of M is specified. For instances, for a binary closed set of symbols, *i.e.*, $M = 2$, there would be two members, such as $\boldsymbol{A} = \{0, 1\}$. The specification at p. 4, line 13 states: "For example, if a binary closed set of symbols is used, the symbols are selected from {0, 1}" (*emphasis added*). The specification at p. 5, lines 14-15 further states: "... with symbol a_k drawn from the 2-ary closed set of symbols $\boldsymbol{A} = \{0, 1\}$. In other words, the symbols are binary." (*emphasis added*). These examples precisely correspond to the mathematical description of a "close set of symbols" discussed above. That is, the general expression $\boldsymbol{A} = \{A_0, A_1, \ldots, A_{M-1}\}$ becomes $\boldsymbol{A} = \{0, 1\}$ in the case where $M = 2$, and A_0 and A_1 are given the values "0" and "1," respectively. In other words, the symbols may simply be "bits." It is believed that one of ordinary skill in the art would understand this straight-forward example to mean that the "closed set of symbols" in this case is a binary set of symbols, and it refers to the possible values of "0" or "1."

With regard to a "base closed set of symbols" and a "revised closed set of symbols," the specification similarly provides concise mathematical descriptions, along with illustrative examples. As recited in the claims, a "revised closed set of symbols" is a partitioning of a "based closed set of symbols." *See* claims 9, 10, 22, and 23. This is clearly described in the specification at p. 7, lines 6-7, which states: "Alternatively, each element of $\tilde{\mathbf{a}}_k^f(i)$ and $\tilde{\mathbf{a}}_k^b(i)$ can be defined on some set partitioning of the M-ary closed set of symbols $\boldsymbol{A} = \{A_0, A_1, \ldots, A_{M-1}\}$. For example, if $M = 8$ and $\boldsymbol{A} = \{A_0, A_1, \ldots, A_7\}$, elements of $\tilde{\mathbf{a}}_k^f(i)$ and $\tilde{\mathbf{a}}_k^b(i)$ may be defined on the set partitioning, where D_0 encompasses $\{A_0, A_1, \ldots, A_3\}$ and D_1 encompasses $\{A_4, A_5, \ldots, A_7\}$" (*emphasis added*). Thus, $\boldsymbol{D} = \{D_0, D_1\}$ forms a set partitioning of the M-ary closed set of symbols $\boldsymbol{A} = \{A_0, A_1, \ldots, A_{M-1}\}$. Upon reading this portion of the specification, one of ordinary skill in the art would understand that in the example provided, for which $M = 8$, $\boldsymbol{A} = \{A_0, A_1, \ldots, A_7\}$ is a "base closed set of symbols," and $D_0 = \{A_0, A_1, \ldots, A_3\}$ and $D_1 = \{A_4, A_5, \ldots, A_7\}$ form a "revised closed set of symbols" that represent a set partitioning of the "base closed set of symbols."

The specification thus provides clear and mathematically concise descriptions, along with examples, of the claim terms "closed set of symbols," "based closed set of symbols," and "revised closed set of symbols." It is believed that a person of ordinary skill in the art would be quite familiar with the type of basic mathematical expressions (e.g., $A = \{A_0, A_1, \ldots, A_{M-1}\}$) used in the specification to provide these descriptions. In addition, such a person would easily comprehend the straight-forward examples provided in the specification that further illustrate these descriptions. Applicants therefore submit that one of ordinary skill in the art would readily understand the descriptions provided in the specification and be enabled to practice the claimed invention. As such, withdrawal of the rejections of claims 2-32 under § 112 is respectfully requested.

Rejection under § 102

Applicants respectfully traverse the rejection of claims 2, 4-15, and 17-30 under 35 USC § 102(e) as allegedly being anticipated by U.S. Patent No. 6,658,071 issued to Cheng ("Cheng"). The present invention relates to a novel data detection technique for obtaining higher confidence information by use of a reduced-state soft-input/soft-output (RS-SISO) algorithm. Specifically, claim 2 is directed to a method, used in a system wherein a model of a finite state machine (FSM) receiving a plurality of FSM inputs and producing a plurality of FSM outputs is represented by a reduced-state trellis and wherein the FSM inputs are defined on a base closed set of symbols, for updating soft decision information on the FSM inputs into higher confidence information. As recited in claim 2, this method comprises: (a) inputting said soft decision information in a first index set; (b) processing a forward recursion on said input soft decision information based on said reduced-state trellis representation to produce forward state metrics; (c) processing a backward recursion on said input soft decision information based on said reduced-state trellis representation to produce backward state metrics, wherein said backward recursion is *independent of said forward recursion*; (d) operating on said forward state metrics and said backward state metrics to produce said higher confidence information; and (e) outputting said higher confidence information (*emphasis added*). That is, claim 2 requires that the backward recursion be *independent* of the forward recursion.

Cheng is directed to a technique for combining a delayed decision feedback sequence estimation (DDFSE) equalizer with a Log-MAP (maximum a posteriori) equalizer to

form a hybrid system that processes of a forward recursion, as well as a backward recursion that is *determined by the forward recursion*. A fundamental motivation for the Cheng patent relates to the need to apply minimum-phase pre-filtering, in order to achieve improvements in the performance of the DDFSE portion of the disclosed hybrid system. See Cheng at col. 1, lines 58-61 and col. 2, lines 36-40. However, the pre-filtering requirement as applied to the hybrid system, using the state configuration shown in Fig. 1 of Cheng, leads to at least two major problems: (1) the break-down of the forward-backward Log-MAP algorithm; and (2) the mis-match of the state-space of the two recursions. See Cheng at col. 2, lines 41-65, and Fig. 1. To resolve these problems, Cheng proposes a different state configuration, shown in Fig. 2 of Cheng. Using this new state configuration, Cheng teaches that the two problems mentioned above may be solved by performing a forward recursion, followed by a backward recursion that is determined by the forward recursion. Specifically, Cheng states that "[t]he decision feedback side information for the backward recursion is not associated with the surviving paths in the backward trellis, but rather is *determined by the forward recursion* to represent backward prediction symbols along each path." See Cheng at col. 4, lines 54-57; col. 5, lines 51-56; and Fig. 2.

Thus, Cheng clearly does not teach or suggest the processing of a backward recursion that is *independent* of the forward recursion, as recited in claim 2. The backward recursion taught in Cheng is NOT independent of the forward recursion. Instead, the backward recursion of Cheng is very much *dependent* on the forward recursion -- in fact it is actually *determined* by the forward recursion.

As to Fig. 6 of Cheng, which is pointed to by the Examiner in the Office Action, this figure actually further demonstrates that Cheng fails to disclose a backward recursion that is independent of the forward recursion. The Examiner states: "Note: Steps 66-72 [forward recursion] and Steps 74-80 [backward recursion] of Figure 6 of Cheng are performed independently of each other, hence backward recursion is independent of said forward recursion." See Office Action at p. 6, lines 6-8. However, Fig. 6 of Cheng is a flow diagram that illustrates the sequence in which steps 66-72 (forward recursion) take place prior to steps 74-80 (backward recursion). The fact that Fig. 6 shows the forward recursion as taking place prior to the backward recursion does NOT necessarily lead to the conclusion that the backward recursion

is independent of the forward recursion. To the contrary, this clear order of events in time is actually consistent with Cheng's teaching, discussed in detail above, that the backward recursion is <u>*determined*</u> by the forward recursion. In other words, Cheng teaches that the forward recursion occurs first, then the backward recursion is determined based the forward recursion. In fact, Fig. 6 clearly shows that the backward recursion cannot start until the forward recursion is complete, or "DONE." See Cheng at Fig. 6, step 72 labeled "DONE?". Thus, contrary to the Examiner's assertion, Fig. 6 of Cheng does not disclose a backward recursion that is <u>*independent*</u> of the forward recursion; it in fact shows an order of events that supports Cheng's clear teaching of a backward recursion that is determined by the forward recursion.

As such, Cheng fails to disclose or suggest "said backward recursion is independent of said forward recursions," as recited in claim 2. In fact, Cheng teaches away from this limitation because the backwards recursion of Cheng is *determined* by the forward recursion and therefore is necessarily *dependent* on the forward recursion. None of the other cited references makes up for the deficiencies of Cheng. Thus, Applicants respectfully submit that claim 2 is neither anticipated nor rendered obvious by Cheng and/or any of the other cited references, either alone or in combination.

Independent claims 15, 29, and 30 each includes at least one limitation corresponding to the limitation of "said backward recursion is independent of said forward recursions" recited in claim 2. Thus, for at the reasons stated above with respect to claim 2, each one of claims 15, 29, and 30 is also neither anticipated nor rendered obvious.

Dependent claims 4-14 and 17-28 depend from independent claims 2 and 15, respectively, and thus incorporate all of the limitations of their perspective independent claims. As such, for at least the reasons stated above with respect to claims 2 and 15, each one of claims 4-14 and 17-28 is neither anticipated nor rendered obvious.

Accordingly, it is believed that each one of claims 2, 4-15, and 17-30 is neither anticipated nor rendered obvious by Chen and/or any of the other cited references, alone or in combination. Withdrawal of the rejection of these claims under 35 USC § 102(e) is therefore respectfully requested.

Rejection under § 103

Applicants respectfully traverse the rejection of claims 3 and 16 under 35 USC § 103(a) as allegedly being unpatentable over the combination of Cheng and U.S. Patent No. 6,145,114 issued to Crozier et al. Dependent claims 3 and 16 depend from independent claims 2 and 15, respectively, and thus incorporate all of the limitations of their respective independent claims. As such, each of claims 3 and 16 is patentable, for at least the reasons stated above with respect to claims 2 and 15. Withdrawal of the rejection of claims 3 and 16 under 35 USC § 103(a) is therefore respectfully requested.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

Ko-Fang Chang

Ko-Fang Chang
Reg. No. 50,829

TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 650-326-2400
Fax: 415-576-0300
Attachments
KC/mmb/ka
60256898 v1